



Victoria Shanghai Academy

Year 6 (MYP 1)  
Mathematics  
Percentage

Name: \_\_\_\_\_

Class: \_\_\_\_\_ ( )

## Checking My Own Progress

I have successfully finished the followings (write the dates inside the appropriate boxes)

Topic	Finished	Answer checked	Corrections done	Teachers comment
P3-4: Decimal fractions – percentages (Mathletics: G2 p.17-18)				
P5: Percentage problems (Mathletics: G2 p.20)				
P6-7: Fractions of an amount – percentage (Mathletics: G3 p.23-24)				
P8: Fractions of an amount – finding discounts (Mathletics: G3 p.25)				
P.9: Discount dilemmas (solve) (Mathletics G3 p.27)				
6A: Finding percentages + Let's Practise! 6a (My Pals 6A Ch6 p.141-147)				
MYP1: Ex 10B.1 + 10B.2 – Converting between fractions and percentages (H&H p.201-202)				
MYP1: Ex 10C.1 + 10C.2 – Converting between decimals and percentages (H&H p.203-204)				
MYP1: Ex 10D –Number line (H&H p.205)				
Review Set 10B (H&H p.213-214)				
6A: Word Problems (1) + Let's Practise! 6b (My Pals 6A Ch6 p.148-154)				
6A: Word Problems (2) + Let's Practise! 6c (My Pals 6A Ch6 p.155-164)				
P.12-13: Discount WS 91-92 (Solving Maths Problems_9-11)				
P.14-15: Discount WS 93-94 (Solving Maths Problems_9-11)				
P.16-17: Percentages WS 98-99 (Solving Maths Problems_9-11)				
P.18: Percentages WS 100 (Solving Maths Problems_9-11)				
p.19: Percentages WS 101 (Solving Maths Problems_9-11)				
P20: Percentage error I (Mathletics set tasks)				
P20: Percentage error II (Math is Fun)				

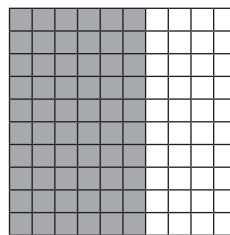
# Decimal fractions – percentages

Percent comes from the Latin 'per centum' and means parts per hundred. It is expressed using the symbol %.

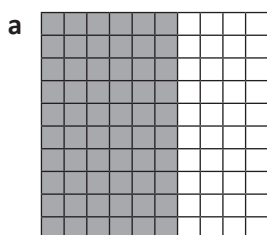
Here, 60% has been shaded. This is the same as 60 hundredths.

$$\frac{60}{100} = 0.60 = 60\%$$

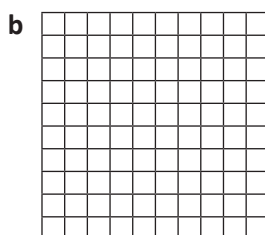
We commonly use percentages in sales – *25% off everything TODAY ONLY*; on tests – *I got 85%*; and when we are gathering and reporting on data – *78% of people surveyed love chocolate*.



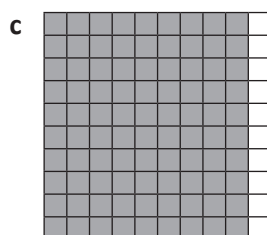
## 1 Fill in the missing values:



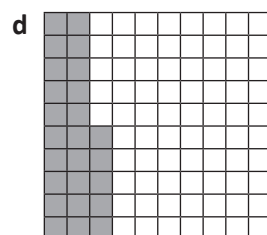
$\frac{60}{100}$	0.	%
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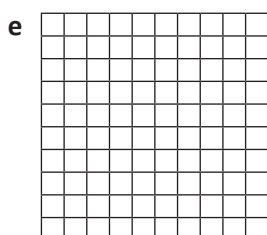
$\frac{30}{100}$	0.3	%
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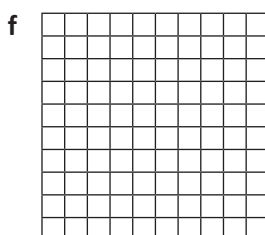
—	0.	90%
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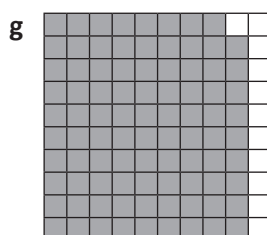
—	0.25	%
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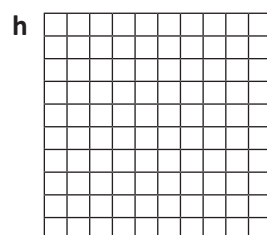
$\frac{45}{100}$	0.	%
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—	0.75	%
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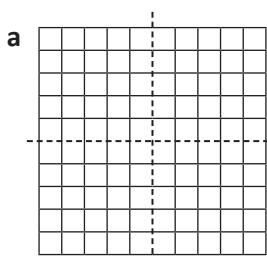
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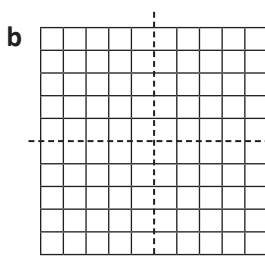
—	0.5	%
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It is useful to know some common percentages such as 25%, 50%, 75% or 100%.

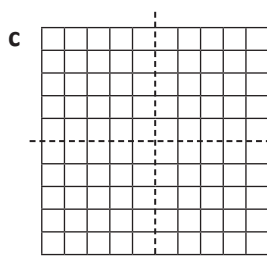
## 2 Shade the grids to show the following percentages:



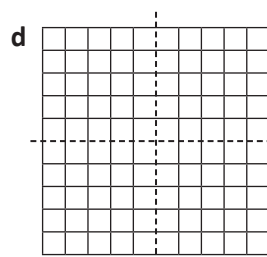
$\frac{1}{4}$	0.	%
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$\frac{1}{2}$	0.	%
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$\frac{3}{4}$	0.	%
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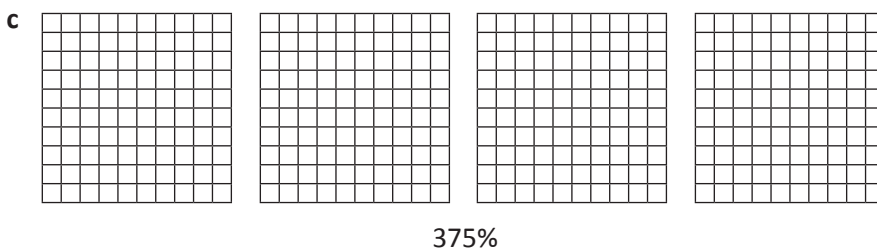
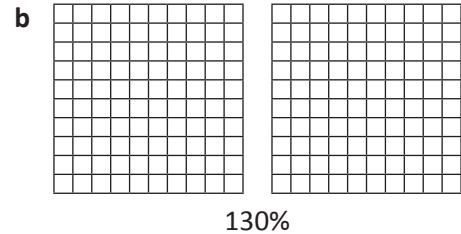
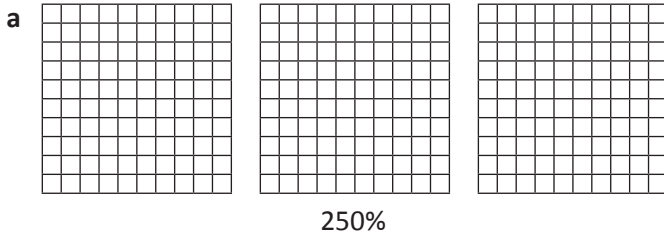


$\frac{4}{4}$		%
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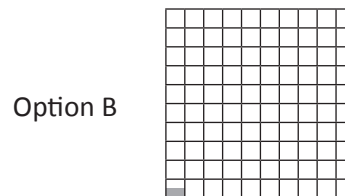
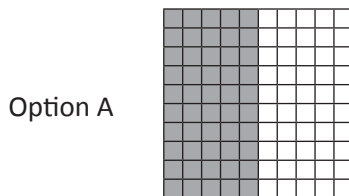
# Decimal fractions – percentages

Not all percentage values are whole numbers between 1 and 100. We can have such things as 300% growth or percentages that contain decimals such as 3.5%.

**3** Shade the grids to show the following percentages:

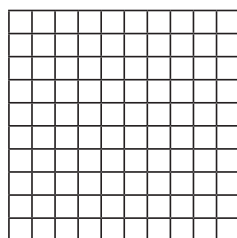


**4** How would you show half a percent? Circle the option you think is correct. Discuss your choice with a partner. Do they agree?

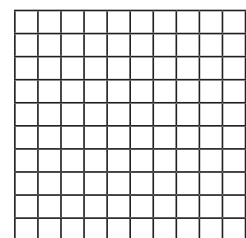


**5** 100 people were surveyed. They were asked to nominate their preferred way of eating vegetables. Shade the grids to show the survey results:

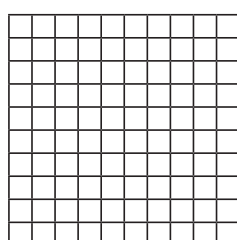
**a** 7% preferred their veggies boiled till they were all soggy and watery.



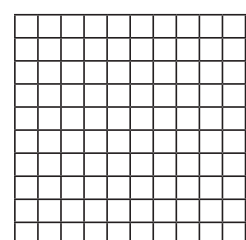
**b** 43% preferred their veggies stir fried.



**c** 19.5% preferred their veggies raw.



**d** 30.5% did not care how they were prepared because they weren't going to eat them anyway.





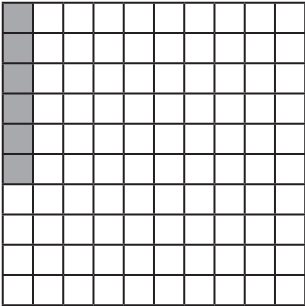
Getting ready

We have been using 100 grids to represent percentage, with each square representing 1%.



What to do

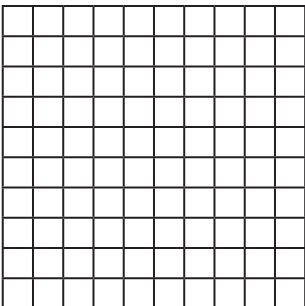
These grids are set up a little differently. Work with a partner to figure out what each square represents and then answer the questions.



### Problem 1

These 6 squares have a value of 36.

- What is the value of 1 square? \_\_\_\_\_
- What is the value of the entire grid? \_\_\_\_\_
- If 50% of the grid is shaded, what value is shaded? \_\_\_\_\_

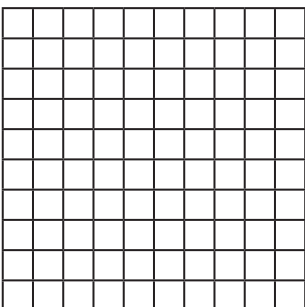


### Problem 2

There are 140 convenience stores in Smallville.

- 40% of these stock your favourite Slurpee flavour. Use the grid to represent this information.
- How many stores sell your favourite flavour? \_\_\_\_\_

300 people



### Problem 3

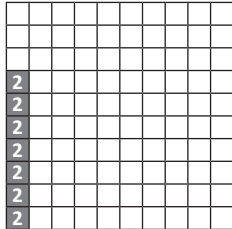
- If this grid represents 300 people, what does each square represent? \_\_\_\_\_
- How many people are represented by ten squares? \_\_\_\_\_
- 60 of the 300 people like watching sports. Represent this on the grid in red.
- 225 people prefer playing sport to watching it. Represent this in green.

## Fractions of an amount – percentage

We often have to find percentages in real life such as ‘40% off – today only!’

40% of 100 is  $\frac{40}{100}$  or 40. A \$100 item would be reduced by \$40.

That’s easy if everything costs \$100 but how do we find percentages of numbers other than 100? There are a number of ways to do this – here are some of them.



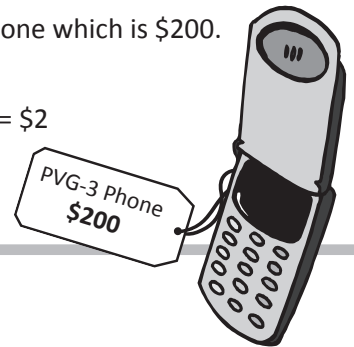
Look at this 100 grid. It represents the total cost of this phone which is \$200.

Each of the 100 squares represents 1% of this.

To find the value of a single square we divide:  $\$200 \div 100 = \$2$

Each square or percent represents \$2.

How do we then find 7% of \$200?  $7 \times \$2 = \$14$ .



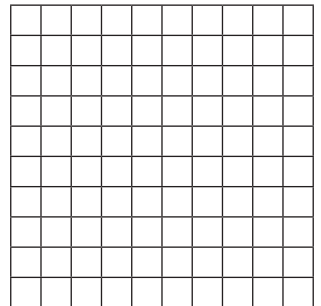
### 1 Use the 100 grid to calculate:

- a 5% of \$200 is \_\_\_\_\_ b 20% of \$200 is \_\_\_\_\_
- c 10% of \$200 is \_\_\_\_\_ d 22% of \$200 is \_\_\_\_\_
- e 15% of \$200 is \_\_\_\_\_ f 50% of \$200 is \_\_\_\_\_
- g If the store advertises a sale of 15% off the cost of the phone, what is the saving in dollars? \_\_\_\_\_

### 2 Use the 100 grid to calculate the following. 1 square represents \_\_\_\_\_ people:

300 people

- a 8% of 300 people is \_\_\_\_\_ b 50% of 300 people is \_\_\_\_\_
- c 25% of 300 people is \_\_\_\_\_ d 40% of 300 people is \_\_\_\_\_
- e 12% of 300 people is \_\_\_\_\_ f 80% of 300 people is \_\_\_\_\_
- g If 65% of the 300 people surveyed liked chocolate, how many people liked chocolate? \_\_\_\_\_



### 3 Patterns can also help us understand percentages. Use patterns to calculate. The first row has been done for you.

10% of 40 is _____ 4	5% of 40 is _____ 2	20% of 40 is _____ 8
10% of 50 is _____	5% of 50 is _____	20% of 50 is _____
10% of 60 is _____	5% of 60 is _____	20% of 60 is _____
10% of 100 is _____	5% of 100 is _____	20% of 100 is _____
10% of 500 is _____	5% of 500 is _____	20% of 500 is _____
10% of 1000 is _____	5% of 1000 is _____	20% of 1000 is _____
10% of 3000 is _____	5% of 3000 is _____	20% of 3000 is _____

# Fractions of an amount – percentage

We can use fractions to help us calculate percentages.

How can we calculate 25% of 80?

We know that 25% is the same as  $\frac{1}{4}$ . To find  $\frac{1}{4}$  of 80 we divide by 4.

$$80 \div 4 = 20$$

$$25\% \text{ of } 80 \text{ is } 20.$$

$$\frac{1}{2} = 50\%$$

$$\frac{1}{4} = 25\%$$

$$\frac{1}{3} = 33\frac{1}{3}\%$$

$$\frac{1}{5} = 20\%$$

$$\frac{1}{10} = 10\%$$

$$\frac{3}{4} = 75\%$$

## 4 Use your knowledge of fractions to calculate the percentages:

a 25% of 120 is

$$\frac{1}{4} \text{ of } 120 = \underline{\hspace{2cm}}$$

$$120 \div 4 = \underline{\hspace{2cm}}$$

b 50% of 250 is

$$\frac{1}{2} \text{ of } 250 = \underline{\hspace{2cm}}$$

$$250 \div 2 = \underline{\hspace{2cm}}$$

c 20% of 50 is

$$\frac{1}{5} \text{ of } 50 = \underline{\hspace{2cm}}$$

$$50 \div 5 = \underline{\hspace{2cm}}$$

d 25% of 16 is

e  $33\frac{1}{3}\%$  of 66 is

f 75% of 80 is



**REMEMBER**

Calculators are also handy for working out percentages. This is how we calculate 40% of 50:

We enter

Our answer appears

## 5 Use a calculator to find these percentages:

a 20% of 300 mL =

b 35% of 280 mL =

c 15% of 800 kg =

d 6% of 70 km =

e 25% of 150 mL =

f 9% of \$700 =

g 15% of 400 =

h 18% of 300 mL =

i 90% of 1000 =

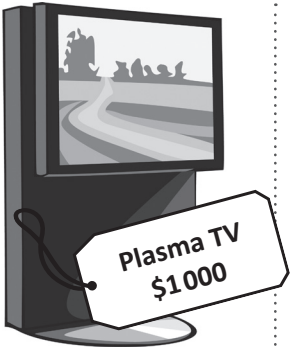

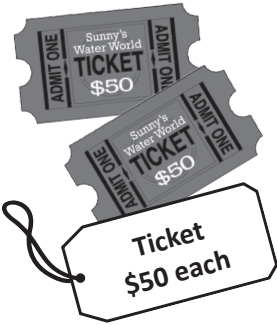

## 6 The answer is 75. Use a calculator to work out the percentages and tick all the squares that match the answer:

What is 25% of 300?	What is 75% of 100?	What is 10% of 750?	What is 15% of 55?
What is 45% of 180?	What is 35% of 300?	What is 50% of 150?	What is 20% of 375?



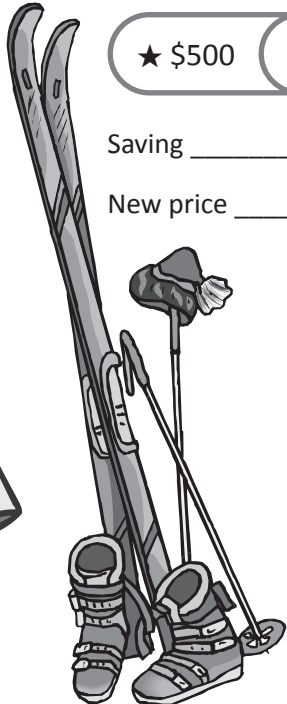


# Fractions of an amount – finding discounts

We have to calculate discounts quite often in real life. Stores have many special offers and canny consumers can quickly calculate the savings to help them make decisions about their purchases.

1 How much would you save if the following discounts were offered? Choose a method to calculate:

 <b>Plasma TV</b> <b>\$1000</b>	 <b>DVD</b> <b>\$12 each</b>	 <b>Ticket</b> <b>\$50 each</b>	 <b>Puppy</b> <b>\$250</b>
10% off _____	10% off _____	10% off _____	10% off _____
25% off _____	25% off _____	25% off _____	25% off _____
50% off _____	50% off _____	50% off _____	50% off _____
60% off _____	60% off _____	60% off _____	60% off _____

2 You are helping your grandpa with his holiday shopping at Savers. Everything in the store marked ★ is 5% off, everything marked ★★ is 15% off and everything marked ★★★ is 20% off. Help your grandpa calculate both the savings and the new costs:

 <b>★★ \$20</b> Saving _____ New price _____	 <b>★ \$85</b> Saving _____ New price _____	 <b>★ \$500</b> Saving _____ New price _____
 <b>★★★ \$15</b> Saving _____ New price _____	 <b>★★ \$40</b> Saving _____ New price _____	



**Getting ready**

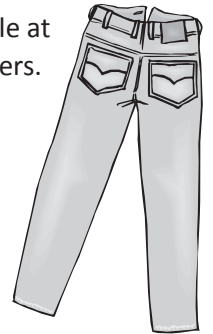
Solve these shopping dilemmas. You can work with a partner or by yourself.  
Show your mathematical reasoning for each problem.

**What to do**

**DILEMMA 1** You have been eyeing off a new pair of jeans available at your local jeans shop and also online. They are \$100 at both suppliers.

In the sales, your jeans shop offers a discount of 20%, followed by a further reduction of 40% on the marked sale price. The online supplier offers a straight 60% discount.

Are these discounts the same? If not, which is the better deal?



**DILEMMA 2** Would you rather become 50% poorer and then 50% richer *or* become 50% richer and then 50% poorer?

**DILEMMA 3** The new game you want costs \$175 at one store and \$180 at another. The first store then offers a discount of 5% while the second offers a discount of 10%. Which deal gives you the cheapest price?

## PLAYING CARDS

## DESCRIPTION

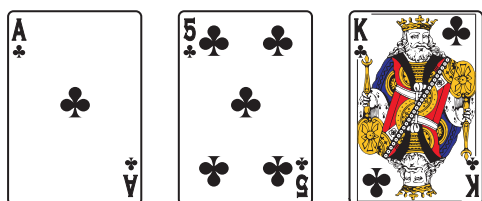
### Description

A pack of playing cards is made up of 52 cards. Each card belongs to one of four **suits** and one of thirteen **ranks**.

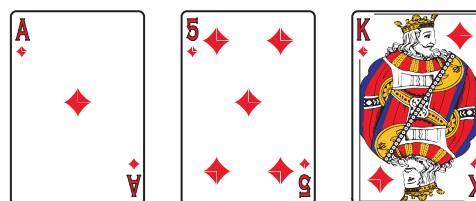
### Suits

The four suits are **clubs**, **diamonds**, **hearts** and **spades**. The symbols on each card indicate which suit that card belongs to. Clubs and spades are always black and hearts and diamonds are always red. There are examples of each suit below.

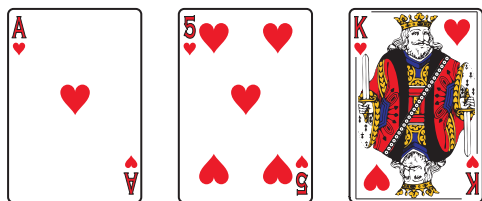
#### Clubs



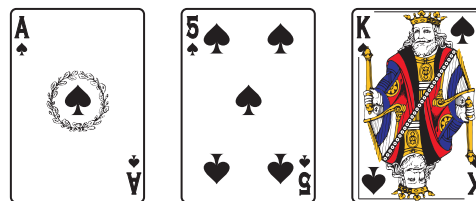
#### Diamonds



#### Hearts

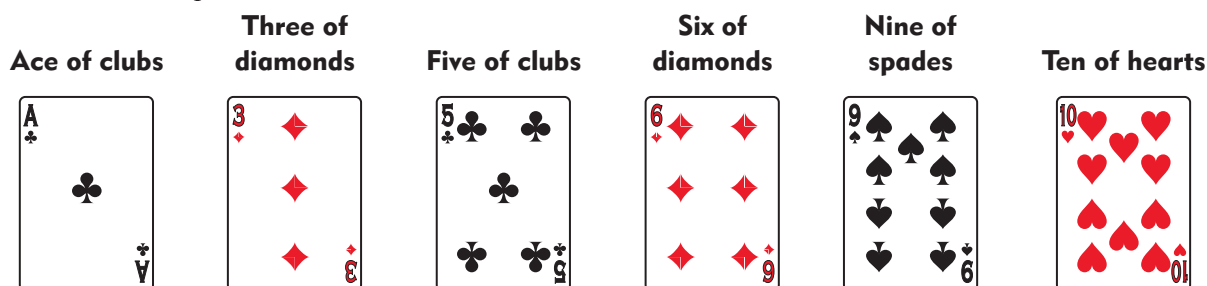


#### Spades



### Rank

For most cards, the rank is indicated by the number of symbols (or **pips**) on the card. So, a card with five clubs on it is called a **five of clubs** and card with ten hearts is a **ten of hearts**. A card with just one pip is called an **ace**. For example:



There are also some cards, known as **picture cards**, that have pictures on them instead of pips. Cards with a picture of a man and the letter J are called **jacks**, while cards showing a picture of a woman and the letter Q are called **queens** and cards with a picture of a man along with the letter K are called **kings**. For example:

#### Jack of spades



#### Queen of hearts

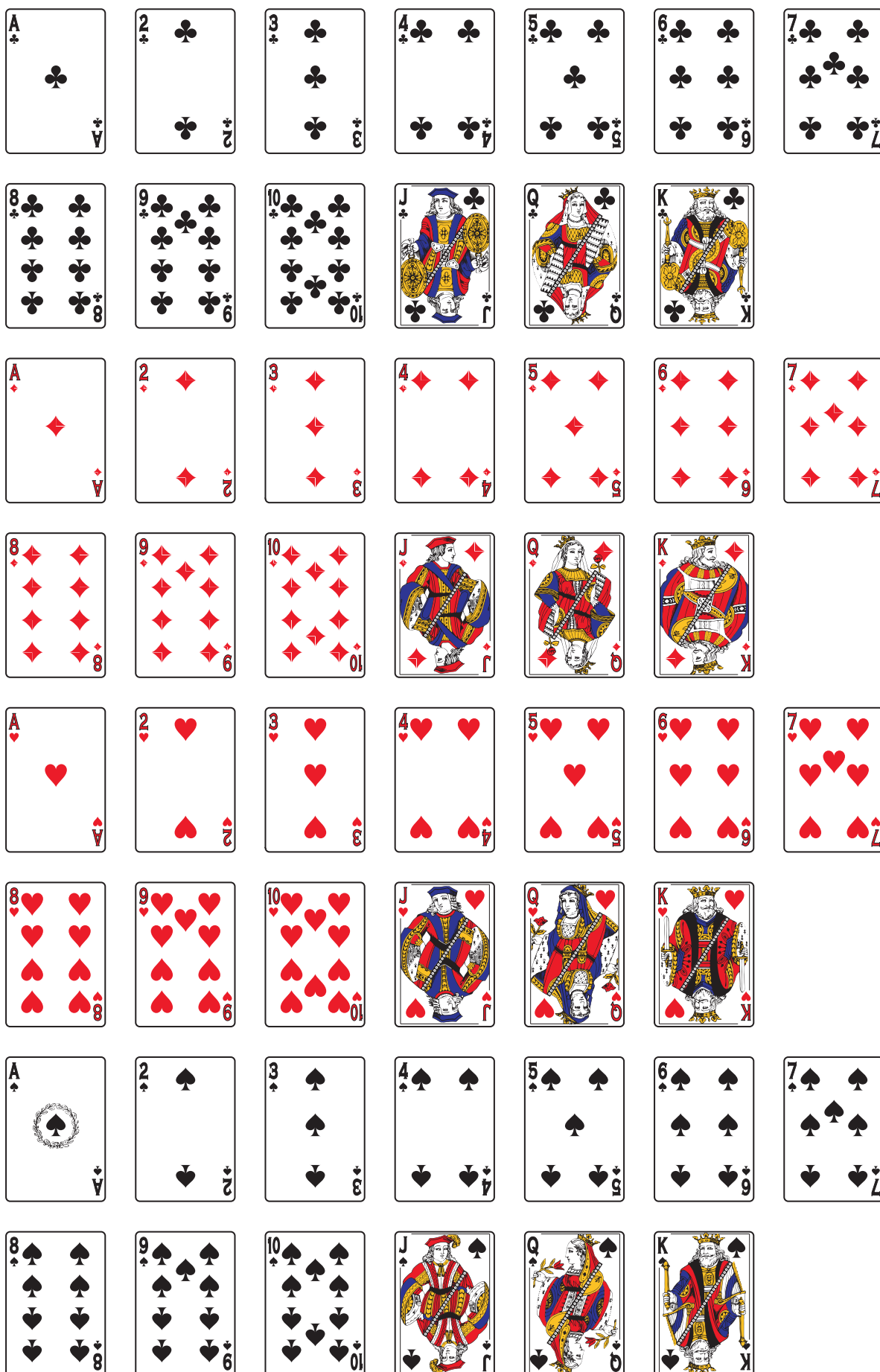


#### King of clubs



## PLAYING CARDS

## COMPLETE PACK











Name \_\_\_\_\_ Date \_\_\_\_\_

# Can we find a 20% discount?

Sheet 91

The manager of a supermarket decides to give a 20% discount on the prices shown. Complete the table below to find the price of each item at 20% discount. Note that the 20% discount will usually be rounded so that the customer gets the best deal. For example, 20% of the Brantime price is 51.8p but the manager will round that up to 52p.

## Special reductions on breakfast cereals

Item	Normal price	20% of normal price	Amount to be subtracted	Reduced price
Brantime 	£2.59	51.8p	52p	£2.07
Poprice 	£1.98			
Weeties 	£2.85			
Special O 	£3.15			
Wheatshreds 	£2.99			
Topcorn 	£2.45			

## Teacher's notes

**Suggested objective:** Find 20% discount on prices shown in pounds and pence.

**Problem:** Can we find a 20% discount?

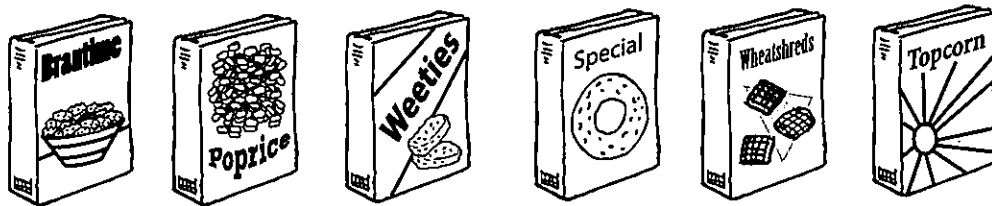
Ensure that the children understand the use of the table and the rounding up of the discount where necessary. You could allow them the use of a calculator or you may prefer to encourage them to find 10% then double it to find 20% – they may then need to round up to find the next whole penny price.

Name \_\_\_\_\_ Date \_\_\_\_\_

# How much money can Mum save?

Sheet 92

Mum orders her groceries online once a month. She likes to buy items that are reduced, then to work out how much money she has saved.



Look at the table on sheet 91 showing prices of breakfast cereals.

How much does Mum save if she buys these cereals at reduced prices ...

2 packets of Brantime and 1 packet of Special O?

3 packets of Topcorn and 2 packets of Weeties?

4 packets of Poprice and 4 packets of Wheatshreds?

1 packet of each type of cereal?

## Teacher's notes

*This activity sheet to be used in conjunction with sheet 91.*

**Suggested objective:** Solve multi-step problems choosing appropriate calculations.

**Problem:** How much money can Mum save?

The children need to extract information from the table created on sheet 89 to be able to complete the calculations specified in the problems on this sheet. Encourage them to follow the 'seven steps to success'.









Name \_\_\_\_\_ Date \_\_\_\_\_

# Can we find a 25% discount?

Sheet 93

The manager of a grocery shop decides to give a 25% discount on the prices shown. Complete the table below to find the price of each item at 25% discount. Note that the 25% discount will usually be rounded so that the customer gets the best deal.

## Special reductions on fruit juices

Item	Normal price	Reduced price
Apple juice 	£0.84	
Orange juice 	£0.96	
Mango juice 	£1.60	
Pineapple juice 	£1.80	
Blackcurrant juice 	£2.20	
Grape juice 	£2.40	

## Teacher's notes

**Suggested objective:** Find 25% discount on prices shown in pounds and pence.

**Problem:** Can we find a 25% discount?

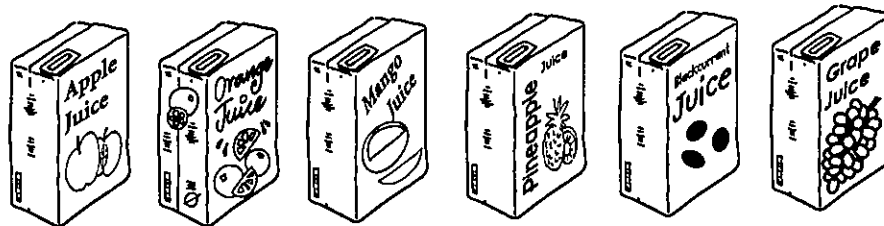
On this sheet the table only has three columns and the children are required to combine two steps to complete each cell in the 'reduced price' column. You could allow them the use of a calculator or you may prefer to encourage them to find 50% then halve it to find 25% – they then have a choice of subtracting 25% from the full price or adding 25% to 50%.

Name \_\_\_\_\_ Date \_\_\_\_\_

Sheet 94

# How much money can Mum save?

Mum orders her groceries online once a month. She likes to buy items that are reduced, then to work out how much money she has saved.



Look at the table on sheet 93 showing prices of fruit juice.

How much does Mum save if she buys the following juices at reduced prices...

2 cartons of apple juice and 3 cartons of pineapple juice?

3 cartons of orange juice and 3 cartons of mango juice?

2 cartons of blackcurrant juice and 3 cartons of grape juice?

1 carton of each type of juice?

## Teacher's notes

*This activity sheet to be used in conjunction with sheet 93.*

**Suggested objective:** Solve multi-step problems choosing appropriate calculations.

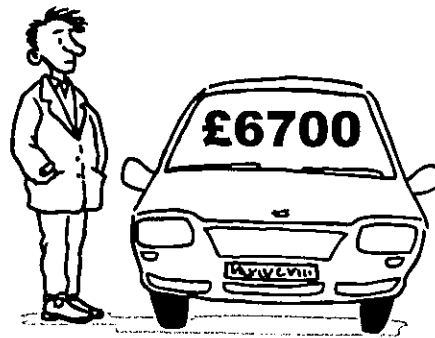
**Problem:** How much money can Mum save?

The children need to extract information from the table created on sheet 93 to be able to complete the calculations specified in the problems on this sheet. Encourage them to follow the 'seven steps to success'.

Name \_\_\_\_\_

Date \_\_\_\_\_

# Can you find percentages of amounts?



Sheet 98

Stan is looking for a new car.  
The car salesman says that Stan can have a 10% discount if he buys this car straight away. How much is the discount worth?

How much is 70% of £540? How much is 80% of £540? How much is 90% of £540? 

For more complicated percentages, we can use a calculator or we can try to work it out in other ways. For example to find 20% of £540:

To find 5% of £540:

**Step 1:** Find 10% by dividing by 10.  
so 10% of £540 = £54

**Step 1:** Find 10% by dividing by 10.  
10% of £540 = £54

**Step 2:** Multiply the answer by 2 to find 20%.  
So 20% of £540 = £108

**Step 2:** Divide the answer by 2 to find 5%.  
So 5% of £540 = £27

To find 30% we could multiply the answer to Step 1 by 3.  
So 30% of £540 = £162

To find 15% of £540. Just add the 5% answer to the 10% answer.  
So 15% of £540 = £81

Combine some of the previous answers to solve these questions:

How much is 40% of £540? How much is 45% of £540? How much is 50% of £540? How much is 65% of £540? How much is 60% of £540? 

## Teacher's notes

**Suggested objective:** Find percentages of whole number quantities.

**Problem:** Can you find percentages?

This sheet provides children with the opportunity to develop a systematic approach to finding percentages mentally. Sheet 99 features problems that can make use of this approach.

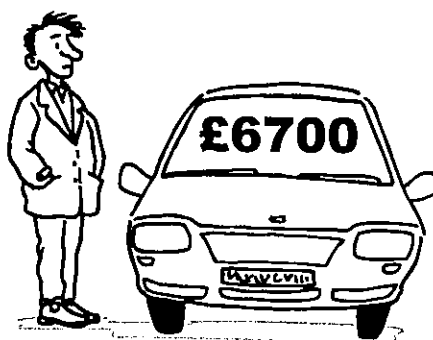




Name \_\_\_\_\_

Date \_\_\_\_\_

# Can you find percentages?



Sheet 99

How much is 10% of £6700?

How much is 20% of £6700?

How much is 5% of £6700?

Use your answers to the questions above to help you to answer these questions:

How much is 30% of £6700?

How much is 70% of £6700?

How much is 90% of £6700?

How much is 15% of £6700?

How much is 25% of £6700?

How much is 85% of £6700?

How much is 75% of £6700?

Stan agrees to buy the car if the salesman will take 15% off the price. What price is Stan offering to pay?

Where have you seen that value before on this sheet?

## Teacher's notes

**Suggested objective:** Find percentages of whole number quantities.

**Problem:** Can you find percentages?

This sheet encourages children to follow the systematic approach to finding percentages mentally. Note that the final question is designed to show the children that 15% discount amounts to the same as 85% of the full price – more able children will be able to make use of the technique shown in this example when tackling further problems.

Name \_\_\_\_\_ Date \_\_\_\_\_

# Can you find percentages?

Sheet 100



How much is 10% of £2450?

How much is 45% of £2450?

How much is 10% of £3600?

How much is 25% of £3600?

How much is 10% of £4800?

How much is 60% of £4800?

How much is 10% of £5200?

How much is 35% of £5200?

How much is 10% of £2900?

How much is 95% of £2900?

The car salesman decides to reduce the prices of all the cars by 15%. Write the new prices on the car windshields.



## Teacher's notes

**Suggested objective:** Find percentages of whole number quantities.

**Problem:** Can you find percentages?

Children need to remember the mental approach to finding percentages that they have practised on sheets 96 and 97. For the final question they will need to find the 15% reduction then subtract this from the original price.



Name \_\_\_\_\_

Date \_\_\_\_\_

# Can you find percentages?

Sheet 101



How much is 10% of £5?

How much is 40% of £5?

How much is 10% of £8?

How much is 35% of £8?

How much is 10% of £6?

How much is 90% of £6?

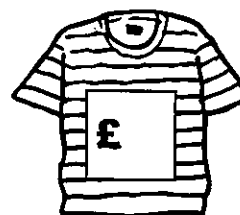
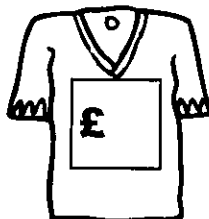
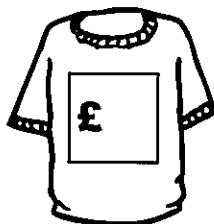
How much is 10% of £9?

How much is 65% of £9?

How much is 10% of £12?

How much is 85% of £12?

The manager decides to reduce the prices of all the tops by 15%. Write the new prices on the tops.



## Teacher's notes

**Suggested objective:** Find percentages of whole number quantities.

**Problem:** Can you find percentages?

Children need to remember the mental approach to finding percentages that they have practised on sheets 96 and 97. On this sheet they will also need to realise that the percentage values could be given in pence or pounds: for example, 10% of £8 could be given as £0.80 or 80p. For the final question they will need to find the 15% reduction then subtract this from the original price.

## Percentage Error I for single measurement (Mathletics)

<p>Calculate the percentage error for the following measurement:</p> <p style="text-align: center;">30.3 mm ↑ tenths</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <b>RULE</b> % error = <math>\frac{\pm \frac{1}{2} \text{ last significant figure}}{\text{actual measurement}} \times 100</math> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px; background-color: #ffcc99;"> <b>Hint:</b> Use place value to determine the last significant figure.         </div> <p style="background-color: #e6f2ff; padding: 5px; text-align: center;">Determine the place value of the last digit.</p>	<p>Calculate the percentage error for the following measurement:</p> <p style="text-align: center;">30.3 mm ↑ tenths</p> <p>30.3 mm is rounded to the nearest tenth ∴ half of 1 tenth:  <math>\frac{1}{2} \times 0.1 = 0.05</math></p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <b>RULE</b> % error = <math>\frac{\pm \frac{1}{2} \text{ last significant figure}}{\text{actual measurement}} \times 100</math> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px; background-color: #ffcc99;"> <b>Hint:</b> This is also known as probable error.         </div> <p style="background-color: #e6f2ff; padding: 5px; text-align: center;">Find half of this value.</p>
<b>Figure 1</b>	<b>Figure 2</b>
<p>Calculate the percentage error for the following measurement:</p> <p style="text-align: center;">30.3 mm ↑ tenths</p> <p>30.3 mm is rounded to the nearest tenth ∴ ± half of 1 tenth:  <math>\frac{1}{2} \times 0.1 = \pm 0.05</math>          ∴ the exact value of 30.3 could range from 30.25 to 30.35</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <b>RULE</b> % error = <math>\frac{\pm \frac{1}{2} \text{ last significant figure}}{\text{actual measurement}} \times 100</math> </div> <p style="background-color: #e6f2ff; padding: 5px; text-align: center;">Interpret this error.</p>	<p>Calculate the percentage error for the following measurement:</p> <p style="text-align: center;">30.3 mm ↑ tenths</p> <p>30.3 mm is rounded to the nearest tenth ∴ ± half of 1 tenth:  <math>\frac{1}{2} \times 0.1 = \pm 0.05</math>          ∴ the exact value of 30.3 could range from 30.25 to 30.35</p> <p style="text-align: center;"> <math>\% \text{ error} = \pm \frac{0.05}{30.3} \times 100</math>  <math>\% \text{ error} = \pm 0.17\%</math> </p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <b>RULE</b> % error = <math>\frac{\pm \frac{1}{2} \text{ last significant figure}}{\text{actual measurement}} \times 100</math> </div> <p style="background-color: #e6f2ff; padding: 5px; text-align: center;">Calculate the percentage error.</p>
<b>Figure 3</b>	<b>Figure 4</b>

## Percentage Error II

The difference between Approximate and Exact Values as a percentage of the Exact Value

Reference: Math is Fun (Kids maths)

<http://www.mathsisfun.com/numbers/percentage-error.html>

$$\text{Percentage error} = \frac{|\text{Approximate Value} - \text{Exact Value}|}{|\text{Exact Value}|} \times 100\%$$

Study the above web page link and answer the 10 questions from the “Your Turn” box.

Record your results (put a tick if it is correct):

Question	1	2	3	4	5	6	7	8	9	10
First attempt										
Second attempt										